

Geel 2000 Language Schools

Science Department

Primary (4)

Second term

(2025-2026)



Name:.....

Class:

Concept 3.1 :- Devices and Energy

Activity (1): sunlight energy can power a cell phone

Technology can help

us turn **light energy**

from the sun into

different forms of

energy that can help

power a cell phone

Example: Solar panels

convert **solar energy** into

electrical energy to power

or charge our phones.



Example:

Solar cells is a device that converts light energy to electric energy to light house and charge devices.



Activity (2) Energy in Remote-Controlled Car

Every day you may use devices that need **energy** to work.
Have you ever thought about where that energy comes from?

Many toys can be operated remotely.

Such as

1. Remote-controlled cars
2. trucks
3. planes
4. boats
5. Drones



Devices need energy to move and do tasks such as:
turning corners, moving remote arms, or operating cameras.

How do remote-controlled toys get their energy?

Devices **use batteries** as a powersource, in batteries the Chemical energy changes into electric energy.

When the batteries are exhausted or run outcharge, they must be:

1. Recharged (plug the device)
2. Replaced with new ones

➤ What happens if...?

- Batteries of remote -controlled toy car run out.
- The car will stop.

Activity 3: Mars Rover Curiosity

1- Mars rover curiosity **is a robot which travels to mars to explore mars planet**

2- The curiosity rover use solar panels to recharge their batteries.

-The solar energy is converted into electrical energy then into kinetic energy and thermal energy when it starts to move

Curiosity converts Solar energy to electric, Kinetic and thermal energy to work sensory systems .



Activity 4: How does the energy change?

<u>Device name</u>	<u>Input energy</u> <u>(consumed energy)</u>	<u>Output energy</u> <u>(produced energy)</u>
 <u>Hair dryer</u>	Electric energy	Thermal Energy Sound Energy Kinetic Energy
 <u>Curiosity rover</u>	Solar Energy	Electric Energy Kinetic Energy Thermal Energy
 <u>Washing machine</u>	Electric Energy	<u>Thermal energy</u> <u>Kinetic energy</u> <u>Sound energy</u>
 <u>Remote control car</u>	Chemical Energy	<u>Kinetic Energy</u>
 <u>Cloth machine</u>	Electric Energy	Kinetic Energy Thermal Energy Sound Energy

Give reason :

You feel warm when you rub your hands

-Because the kinetic energy is converted into thermal energy

What is the source of energy, or energy input and the output for each device ?

1. Bike

2. Phone:

3. Saw

Activity 5: Energy Chains: How would you trace energy from its source to a device in use?

Sun is the main source of energy on earth

Energy chains often start with the sun



To know **how energy gets inside the device we use**. We can draw **energy chains** that show **the path of energy** from **the sun** to different **devices**.

The energy chain for eating an orange



Light Energy



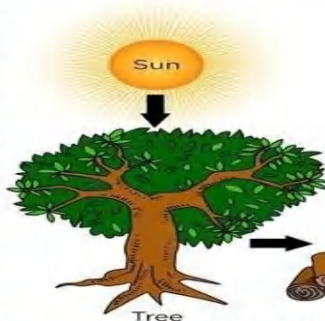
Chemical Energy



Kinetic Energy

Energy chain starts with energy from the sun hitting the Earth as **light**. A plant, such as an **orange tree**, transforms that **light** energy into stored **chemical energy** as it makes sugars when you eat the orange, your body uses the chemical energy to move.

The energy chain for heating a pan of water over a fire



Light Energy

Chemical Energy

Thermal Energy

Thermal Energy

Energy from the sun is stored in the tree's wood as a chemical energy to grow up, when we burn the wood produced heat energy to heat water or cook food.

1. Sun converts nuclear energy to light energy

2. Wood/tree absorbs light energy and changes it to chemical energy.

1. firing Wood produces thermal energy

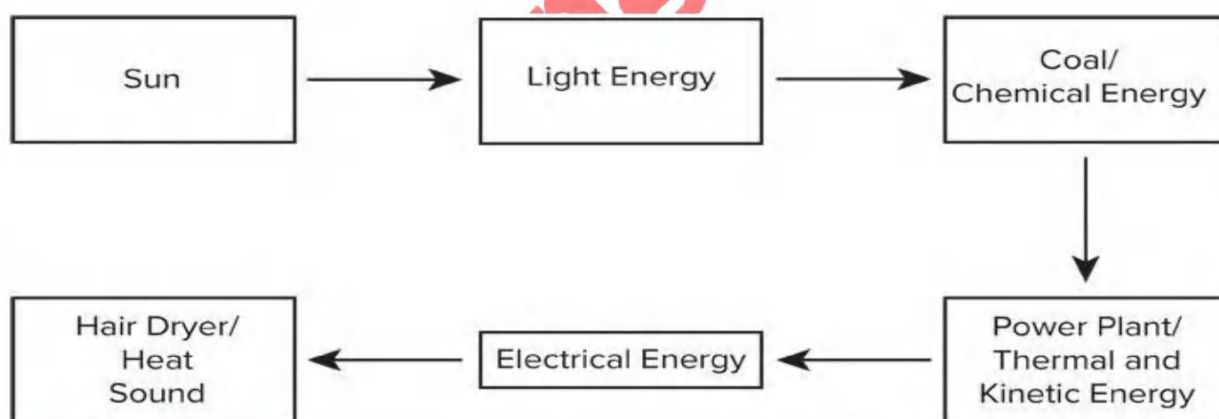
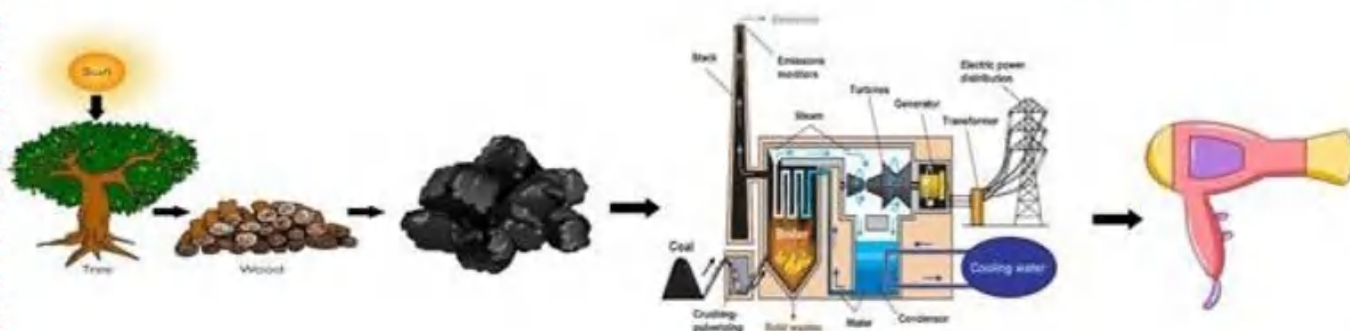
2. Thermal energy transfers from firing wood to the pot of water to heat it.

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The energy chain for a hair dryer

The energy chain for a hair dryer **is more difficult**. The **electrical energy** that **powers a hair dryer** reaches it along an electric cord that is made of copper.

The **electrical energy** comes from a **power plant** of some type. Perhaps it burned **coal** or **gas** to make this electrical energy. But **where did this energy originally come from?**



A diagram shows the energy chain for movement of energy starting with sun/nuclear energy and ending with hair dryer/heat sound.

Power plants burned coal, a form of chemical energy. Coal was formed millions of years ago from dead trees. The trees have gotten their energy from sunlight.

Not all energy that enters an energy chain reaches the device and gets used as we intend. At each link in the chain, **some energy escapes as other forms**. **It still exists**, but it gets **transformed into another energy form** that is not used by the device. Most of this energy is in the form of heat.

Activity 6:

Determine energy input and output of each device

Small battery clock

Handheld fan

flashlight

Hand bell

Toy car

Lamp

<u>Device</u>	<u>Function</u>	Form (s) of energy in	Forms of Energy out
<u>1. Lamp</u>	Lighting	electrical	Light, thermal

Lesson 3 :

Activity 7

The Conservation of Energy Law

Energy is neither created nor destroyed. But it can be changed from one form to another. - **Energy is never lost** - **Energy is changeable**.

Examples of Energy changes from one form to another form

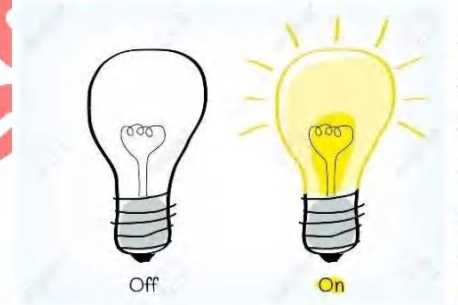
1. Turn on a light bulb, you are starting an energy transformation.

“**Electrical energy** that powers the light bulb is converted into **light and heat energy**”.

If you hold your hand near some light bulbs, you can feel their heat.

It means that new energy cannot simply be **made from nothing**, and old energy **does not disappear**.

Energy just changes types and forms



Note :

- Not all energy in an energy chain reaches the device .
- most of the **wasted energy** leaks out in the form of **heat** .

2. Eating breakfast (Energy conversion)

If you have ever ridden a bike, you are part of a series of events that involve energy conversion



Chemical Energy



Mechanical Energy

Explanation

You eat breakfast so that the **Chemical energy** in your food will give your body energy. As you push on the bike pedals with your legs, you cause the bike to move.

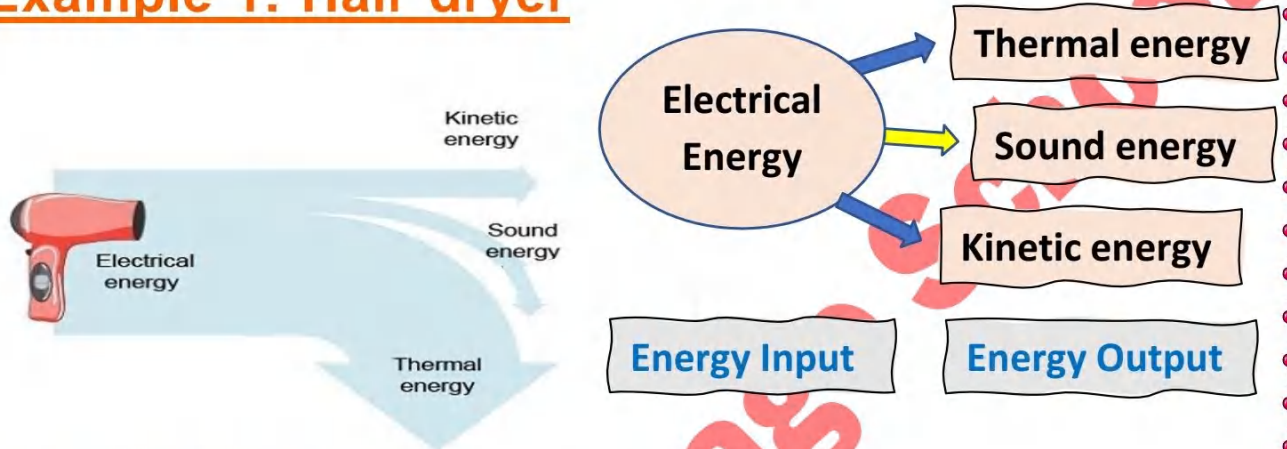
You are **changing chemical energy into mechanical energy**. The **mechanical energy** in the bike is also becoming **heat energy** as the tires rub on the road.

Lesson 4

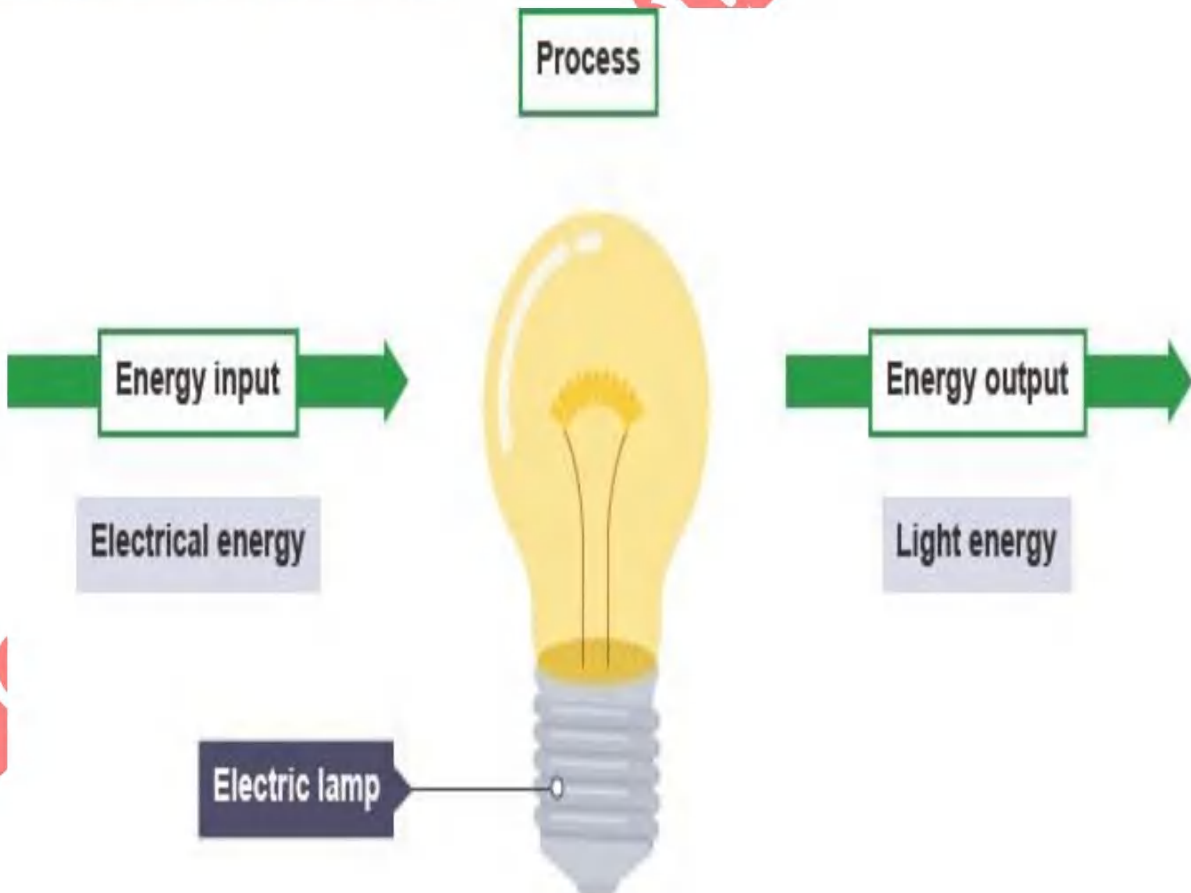
Activity 8: The flow of energy

No one likes it when their cell phone battery dies. Why does this happen? Where does the energy go?

Example 1: Hair dryer



Example 2: Light bulb



Example 3: Cell phone



Electrical Energy

Chemical Energy

Kinetic Energy

Light Energy

Sound Energy

Energy enters the device as electrical energy. It is stored in the battery of the phone as **Chemical energy**. When a phone is on or in use, the phone changes some of this stored energy. The **chemical energy** in the battery is converted into other types such as **light energy**, **sound energy** and **kinetic energy** when it's vibrating.

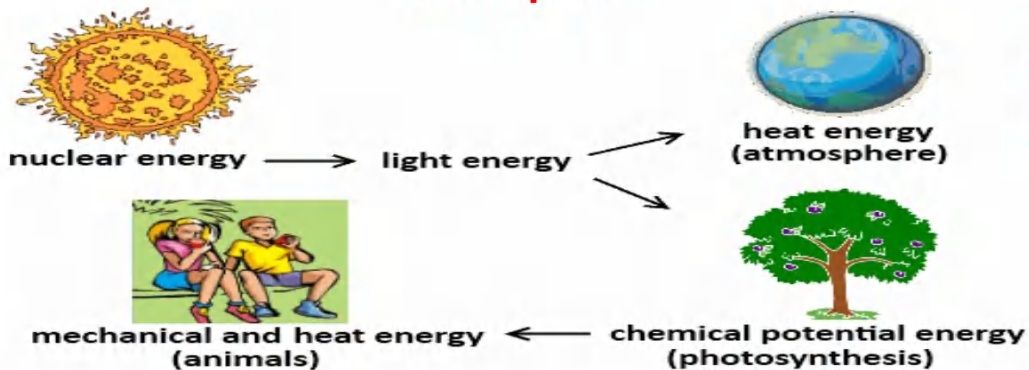
Activity 9 Build an energy chain

Energy Chain

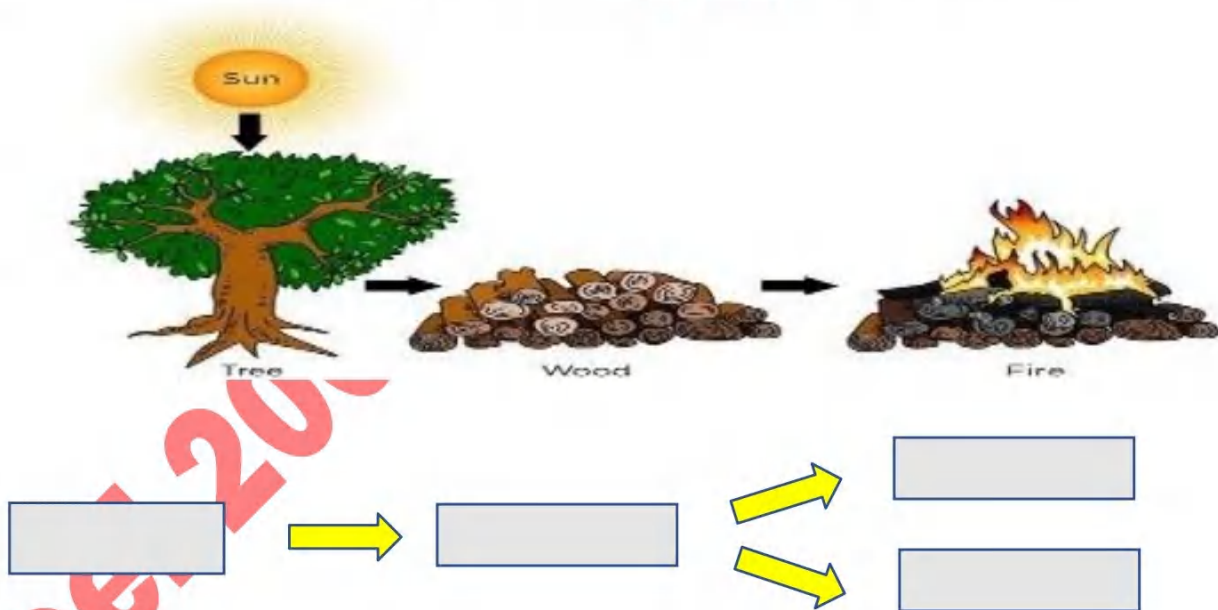
The pathway of energy change from one form to another.

Transfer of energy from one object to another such as heat energy.

Examples



Energy from the sun is stored in the plants which are converted from light energy to chemical energy during photosynthesis process as humans and animals can get their energy to do work when they eat the plants.



Energy from the sun is stored in the tree's wood as a chemical energy to grow up, when we burn the wood produced light and heat energy to boil water or cook food.

Concept 3.2

About fuels

lesson (1)

Activity 1: where the fuel we use every day, such as in cars and trucks, comes from?

(Gas station – gasoline – fuel)

Cars and trucks need..... as a source of energy to move.

This energy comes from.....

When the car is run out of... .., we should go to gas station.



Gas from the **gas station** comes from oil. We dig oil out of the ground

Oil is a fossil fuel. Fossil fuels are deep in the ground. We use fossil fuels to **heat our houses** and to **supply gas** for our cars.



Activity 2: Can cars move without fuel?

When the car is running out of gasoline, we should go to gas station, Cars need fuel as a source of energy to move. The car burns the gasoline in the engine, and the engine turns the wheel.

Chemical energy

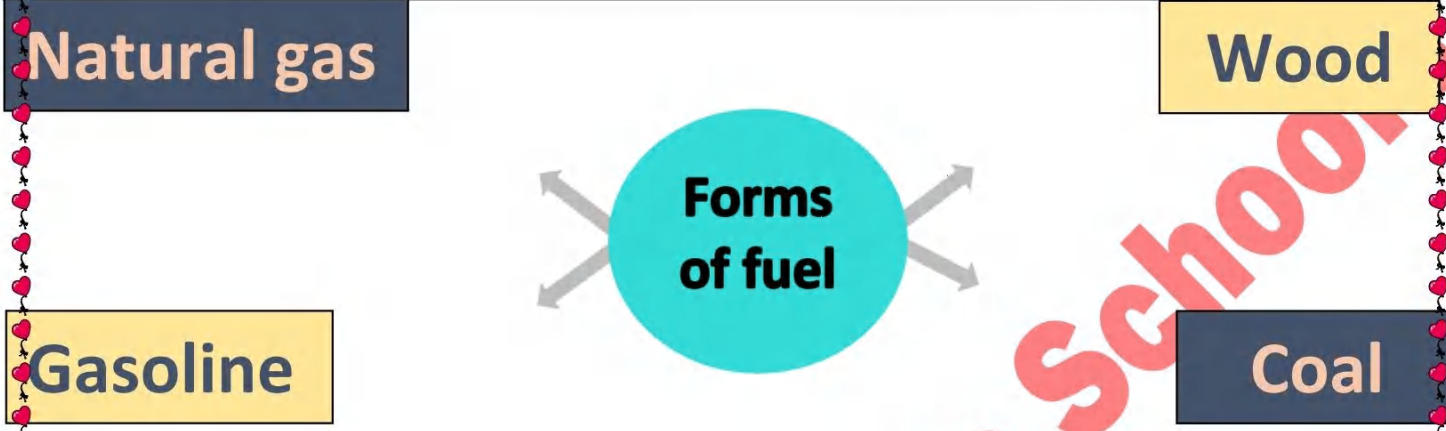


Kinetic energy

- **Fuel** : it is any substance that produce thermal energy when it is burned .
- burning of **gasoline** or **natural gas** allows cars to move .

Activity 3: Fuels We Use

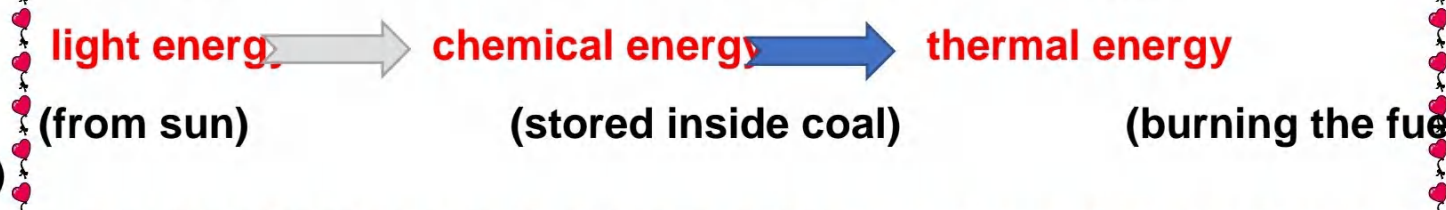
Fuel is a source of energy that has many forms and uses.



Uses of different forms of fuels

Gasoline	Natural gas	Coal	Wood
			
Running on vehicles	Used for cooking food	Cooking food and operation some trains	Warming houses

the energy chain of fuel that can be used to get thermal energy :



Lesson 2

Activity 4: Types of fuels

POC	1. Biofuels	2. Fossil fuels
Definition	It is a type of fuel made from plants that can be cultivated.	It is a type of fuel made from decomposition of the remains of plants and animals that buried for a long period of time .
Examples	1. Wood 2. Charcoal 3. types of plants like corn, grass, woodchips Wood is the most ancient fuel and is still widely used . - Charcoal made from wood. - Some plants can be turned into <u>liquid fuel</u> as corn ,wood chips and grass.	1. Oil 2. Natural gas 3. Coal 4. Gasoline

Advantages	1. It is a renewable source of energy 2. Low-cost	We use fossil fuels daily for 1. lightening houses 2. Warming houses. 3. Cooking. 4. operating cars
Disadvantages	1. To get it requires cutting down trees. 2. removal of forests	1. It is a non-renewable source of energy 2. It causes air pollution 3. Global warming
Renewable or Non-Renewable	Renewable source of energy	Non-renewable source of energy

Fuel can be classified into

1. Renewable sources of energy	2. Non-renewable sources of energy
They are natural materials that can be <u>replaced</u> soon <u>after it is used</u> .	They are the natural materials that are <u>used faster</u> than they can <u>be replaced</u> .
<u>The biofuel such as</u> 1. Wood 2. Charcoal 3. Solar energy 4. Hydroelectricity 5. Wind energy 6. Water	<u>Fossil fuels such as</u> 1. Coal 2. Natural gas 3. Gasoline 4. Gasoline

➤ Note :

- The original source of energy in biofuel and fossil fuel is the sun .
- Gasoline is a fuel made from oil .

Renewable biofuels require careful management

1. **For example,** using wood as a fuel requires cutting down trees. While some trees may grow to **their full height in one person's lifetime.**
2. Many trees grow a few centimeters each year. This means that it would take many lifetimes for **these trees to reach maturity.**
3. **Cutting down trees at a faster rate** than they can grow leads to **deforestation** which has a variety of negative impacts on our environment.



Give reasons for :

Biofuel is a renewable energy?

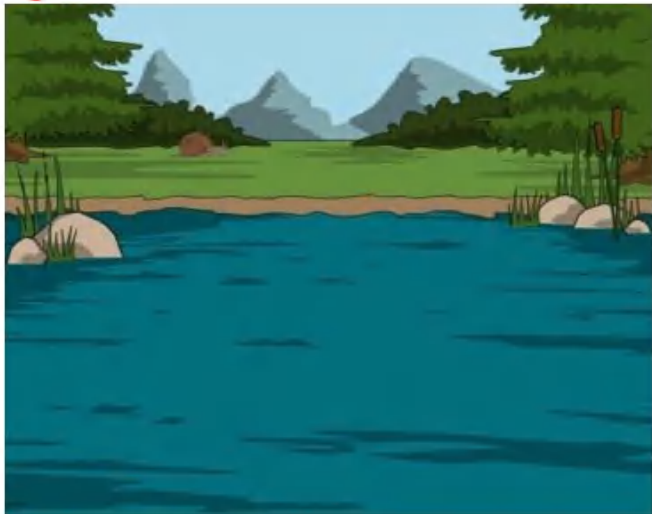
Because it can be replaced shortly after being used .

Fossil fuel is a non-renewable energy?

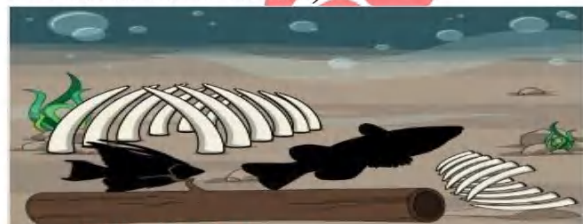
Because it take millions of years to be formed.

Activity 5: Formation of coal

1. Swamps exist 350 million years ago.



2. As living organisms died and trees fell to the bottom of these swamps and ocean where they decomposed. Over millions of years, they buried by sediment (under Layers of sand and mud).



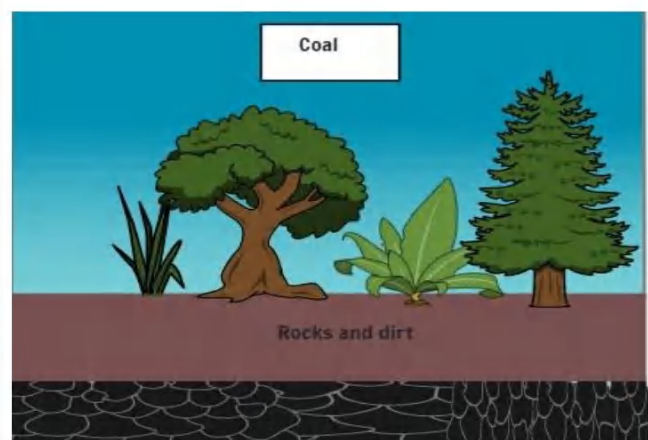
3. Heat and pressure decayed (changed) plants and animals into fossil fuel like coal.



Heat

4. Coal, oil and natural gas are formed from remains of trees and animals, heat and pressure.

Note: coal was formed from remains of plants but oil and gasoline were formed from remains of animals.



Activity 6: Oil and water: How oil is formed?

Oil and water are among the sources that human use to generate energy.

1. Petroleum Oil

Scientists believe that is formed from **the decomposition of sea creatures**

Oil is a non-renewable resource of energy.

The **chemical composition** of **water** differs from that of **oil**, so they don't mix

How oil is formed?

1. Oil is formed from **the decomposition of sea creature**, as the sea creatures dead, their remains settled on the ocean's floor.



2. They become covered with layers of **sediment and rocks**, over many millions of years, the sediment and rock built up more and more layers.



3. All these layers created **great heat and pressure** which turned the remains into oil and gasoline.



2. Water

Water is a renewable resource of energy.

Human use water flowing to **generate electricity**

The differences and similarities between water and oil

	Water	Oil
Differences	It is from renewable sources of energy	It is from non-renewable sources of energy
Similarities	Both used for getting energy	

Nonrenewable resource	Renewable resource
Is a natural material that is used faster than it can be replaced. Such as (oil) We use oil faster that new oil can form.	Is a natural material that can be replaced soon after it is used Such as (water)

Although **water** is a renewable source of energy it must be used very wisely and shouldn't waste be **wasted** or **polluted**.

Water may replace as quickly as we need it. So, we must conserve it.

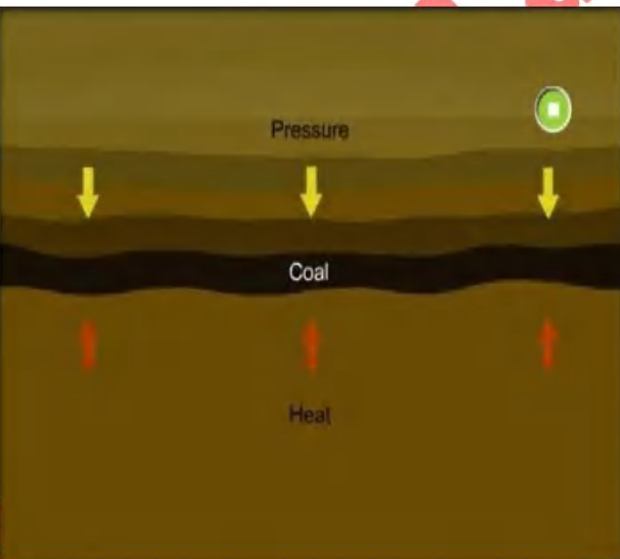
The use of oil and water can be rationalized by

1. Ways to conserve oil consumption	2. Ways to conserve water consumption
<u>-Using public transportation</u> instead of private cars <u>-riding a bike or walking instead of driving a car .</u>	<u>-Growing plants</u> that don't need irrigation water <u>in large quantities</u> -avoid wasting or polluting water .

Lesson 3

Activity 7: Formation of fossil fuel

The steps involved in the formation of fossil fuels

1. after the living organisms dead	2. Remains were buried
	
3. Heat and pressure affected the remains	4. Remains changed to become coal, oil and natural gas
	Fossil Fuel Examples  Coal Oil Natural Gas Kerosene Propane sciencenotes.org

Activity 8: Living without electricity

it is important for everyone to understand **how much electricity they use** and find ways to **conserve energy**. In this activity, you will **document** your experience of spending some **time without using electricity**.

Document your experience

1. How long were you able to go without using electricity?

.....

.....

.....

2. What types of devices would you normally have used during this period of time? What did you do instead?

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3. How did you feel during and after this experience? Do you feel that you normally take electricity for granted?

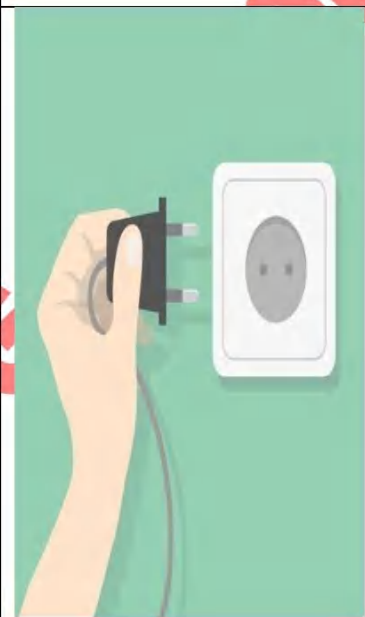
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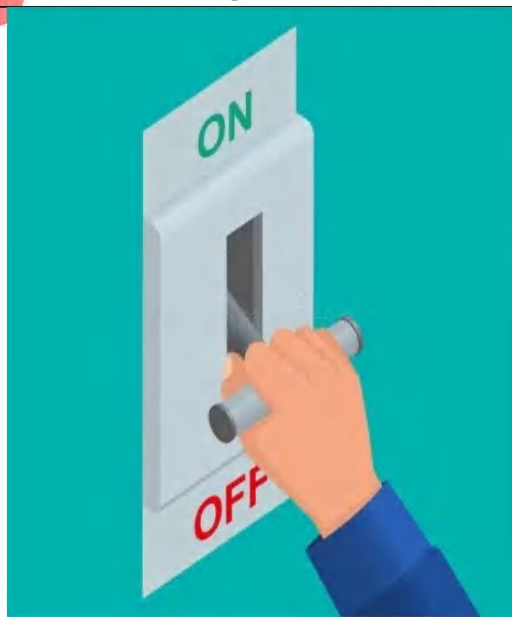
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4. What can you do at home to conserve fuels and avoid wasting electricity?

1. Unplug devices



2. Set aside regular electricity -free times



3. Turn off lights

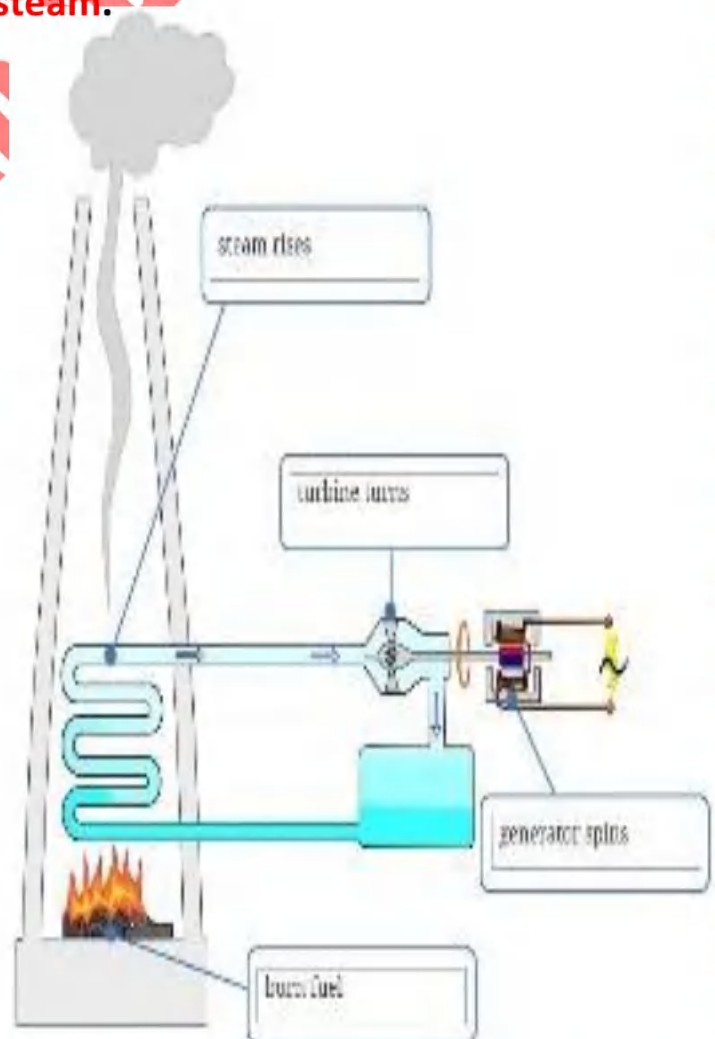


Activity 9: Using Fossil Fuels to Generate Electricity

You already know that gasoline is used to provide energy to make cars move. **But what about the electricity you use to power the lights in your home? Where does it come from? How are fuels involved in generating electricity?**

How fossils fuels are used to generate electricity.

1. Electric is generated in a **power plant or electric power station**.
2. when **fuel** are **burned** they produce **thermal energy**.
3. This is used to heat water to make **steam**.
4. The steam is used to turn a device called "**turbine**".
5. This **kinetic energy** is used to **turn a generator**.
6. A generator **transforms kinetic energy into electrical energy**.
7. The **electric energy** travels **through wires to homes and industries**.



Lesson (4)

Activity 10: Big City Environmental Concerns

- ❖ Using Fossil fuels can have negative impacts on the environment.

The reasons of increased pollution in large cities

1. Burning fuel	2. Pesticides	3. The chemicals
		
Can pollute the air (Population demands)	used in farms (Agriculture) can be carried into stream when it rains. -Pollute water and soil.	Used in factories (Industry) lead to <u>pollute</u> air, water and nearby soil.

The danger of pollution

Pollution, in the forms of **runoff**, **smog**, and **ground contamination**, is especially **severe** in large cities.

Example of **The negative impact of pollution on respiratory system**: **Smog from Automobile**



1. smog from automobile **emissions** (**Harmful gases**) causes widespread **irritation to eyes and lungs**.

2. smog is **full of tiny particles** we breathe in **irritate** our **lungs** and **respiratory system**.

Activity 11: Burning fossil fuels

1. Fossil fuels include (coal – oil – natural gas).
2. Burning fossil fuels **release energy**, people use this energy to **generate electricity**, and this energy also **makes pollution and affects the environment**.

Burning of fossil fuel not only generates electricity but also causes pollution.

Burning fuel produce the **carbon dioxide gas** (Co₂) is the main reason for the formation of **acid rains** and **global warming** phenomena on Earth.

1. Acid rains

How it forms

1. Burning fossil fuels produce harmful gas carbon dioxide (CO₂).
2. Carbon dioxide combines with water vapor in the air to produce carbonic acid which cause acid rains.

Acid rains effects

1. The death of trees
2. Changing the chemical nature of lakes, which kills fish.
3. Changing the chemical nature of the soil.
4. Damage the surfaces of buildings and statues.



2. Global warming

How it forms

1. Burning fossil fuels produce a lot amount of carbon dioxide that collects in the air to form a layer in the atmosphere.
2. This layer traps heat on Earth. So, the Earth's temperature increases slowly and causing the global warming phenomena.

Global warming effects

1. The Earth's temperature increases that **causes death** a lot of living organisms.
2. **Severe weather** (Reading only).
3. **Sea level will rise** due to the melting of ice. (Reading only)



Lesson (5)

Activity 12: conserving fossil fuels

1. There is a **limited amount** of fossil fuels on Earth.
2. Fossil fuels will **run out** because they take millions of years to be formed as they can't be replaced as quickly as we use. So, we must conserve the fossil fuels.
3. There are **many ways to conserve** fossil fuels from running out.

Ways of conserving fossil fuels

1-Walking or using bicycles

instead of driving car.



2. Turning off lights



3. Replacing fossil fuels with renewable energy



Disadvantages of fossil fuels

1. Burning fossil fuels release harmful gases that cause air pollution.



2. Burning fossil fuels cause global warming. (Increasing of the Earth's temperature).



Concept 3.3 : Renewable Energy Resources Lesson (1)

activity (1)

What is the meaning of renewable energy resources?

Renewable Energy Resources

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Examples

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Renewable Energy Resources

The energy that is generated from natural processes that are not run out

Sources

1. Solar Energy

The sun is the main source of energy for humans, plants and animals
A vast majority of our energy on Earth comes from the sun

2. Wind Power

When the blades of a wind turbine spin, they convert wind energy to electrical energy

3. Water Power

When the blades of a water turbine spin, they convert water energy to electrical energy

What are the different ways we can use renewable energy to generate electricity?

We can generate electricity using several different renewable energy resources.

Renewable energy means that it does not run out faster than we use it.

Types of renewable energy sources are wind, water, and solar energy.

Examples: Solar panels generate electricity to light streets.

Note :

- Hundreds of years ago, people needed machines to make their lives easier.
- In the past, people used wind and water mills to grind grains, but now they used wind and water turbines to generate electricity .

Activity (2): Windmills and Watermills

Watermills



Advantages

- Renewable energy resource.
- Low cost
- Use water

Disadvantages

Don't work when drought (dry)

Windmills



Advantages

- Renewable energy resource.
- Low cost
- Use wind

Disadvantages

Don't work without wind blow

Old and modern turbines:

Modern wind Turbines



Old windmills



The similarities:

Both have blades and depend on wind blowing

1. Advantages

- * Get mechanical (kinetic) energy from air.
- * Low cost.
- * They are renewable resources of energy. —

2. Disadvantages

Sometimes wind doesn't blow.

The differences:

Used for generating electricity

- * They don't have openings in their blades.
- * They have few blades.
- * It converts kinetic (mechanical) energy to Electricity

Used for crushing grains to make flour

- * They have openings in their blades.
- * They have more blades.
- * It generates kinetic energy to crush grains .

Modern water Turbines

- * They use the energy of water movement.
- * They generate electricity.



Old watermills

- * They use the energy of water movement.
- * They crush grains.



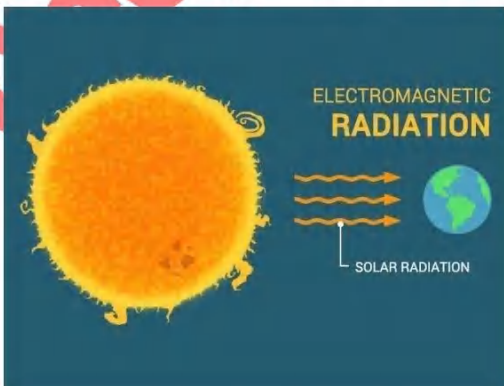
Activity (3): using energy from the sun

How is solar energy converted into types of energy we can use?

-Important points on the solar energy:

The energy received from the sun is called **solar energy**. We can use it as a thermal energy

The **rays** that come from the sun (Sunlight) is called **radiant energy** or **Radiation**.



Using energy from the sun

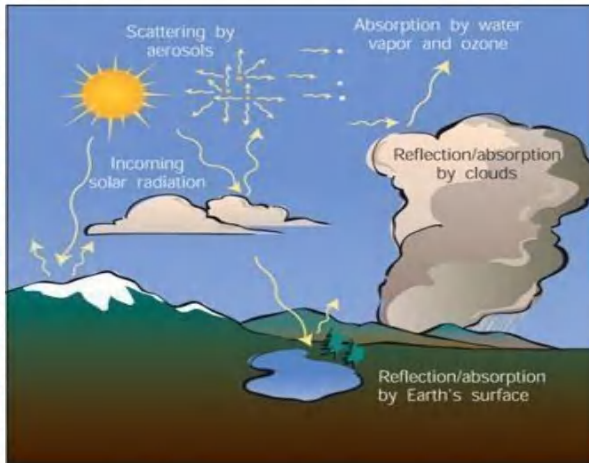
A. Feel the warmth of the

B. Greenhouses

Uses of solar energy:

A. Feel the warmth's of the sun's energy

The atmosphere, water, land and Earth's surface absorbed the sun's energy to increase their temperature.



C. heating water and cooking food by using curved mirror, which direct sunlight to heat the water



B. Greenhouses

1. Built in the way enables the energy from the sun such as light and radiant to warm them.
2. Done by placing glass window on the walls that faces the sun for the longest time.
3. Convert radiant energy into heat energy that warms the inside of the greenhouse.
4. Help farmers grow crops that would normally only grow in warm climates.

D. The solar heater



Heat the water as it passes through the pipes. By placing panels made of black pipes on the roofs of houses, we can store hot water (In tank) for use at another time.

1. Solar water



Black pipes placed on the roof of houses to heat the water.

2. Solar panels are composed of many small solar cells)



is a device that **converts**

light or solar energy

thermal energy to heat water for bath and shower.

It generates electricity by

changing light energy (solar energy) to electric

Energy

Uses of solar panels:

1- To light house and charge devices.
as: calculator
(contains small solar cells)

2- To light streets.

Note :

Greenhouses: allow the entry of solar energy, then this radiant energy is converted into thermal energy that warms the greenhouses , which helps farmers to plant.

Warming houses: houses can be built in a way that enables energy of the sun to warm them by placing large windows.

Cooking foods: convergent mirrors are used to collect some rays to heat metal pots and cook the food.

Activity 4: Have you seen solar panels in your community?

Small solar panels	Large solar panels
Work as one cell only	Work In set
Supply energy <u>to power only one streetlight</u>	Supply energy <u>to whole buildings or towns</u>

Solar panels: How its work

They are made of small solar cells that catch the radiant energy of the sun and turn it directly into electricity this called solar

Solar panels: The importance of solar panels
The electricity that generated from solar panels can use in

Stored in batteries

Such as Solar-cell calculators run on batteries powered by small solar cells



Turn on a streetlight

The electricity can be used immediately, such as to turn on a streetlight



Houses and Buildings

use electricity made from rooftop solar panels.



Power Irrigation equipment

solar power gives farmer the energy they need to run machines that water his plants twice a day.



How does the system convert the energy from the sun?

The solar panels **use metal and plastic materials** to capture the sunlight and convert the sun's energy to **electrical energy**.

If the sun's energy is the input of the solar panel system, what is the output of the system?

The output of the solar panel system is

Lesson (3) : Using the energy of the wind:

Activity (5)

How wind turbines turn the **Kinetic energy** of wind into **electric energy**?

The sun is not the only renewable source of energy.

As the sun warms Earth, it warms the air.

Different parts of the world get different amounts of this **solar energy**, which causes the air to move and wind to blow.

We can use the energy in the wind to turn the blades of **Windmills**.



This kinetic energy can be used to generate electrical energy. Electrical energy is transmitted to the houses through **wires**.

The electricity from wind turbines is carried by big wires to places where it is needed.



Draw the energy chain illustrates the inputs and outputs of wind turbine

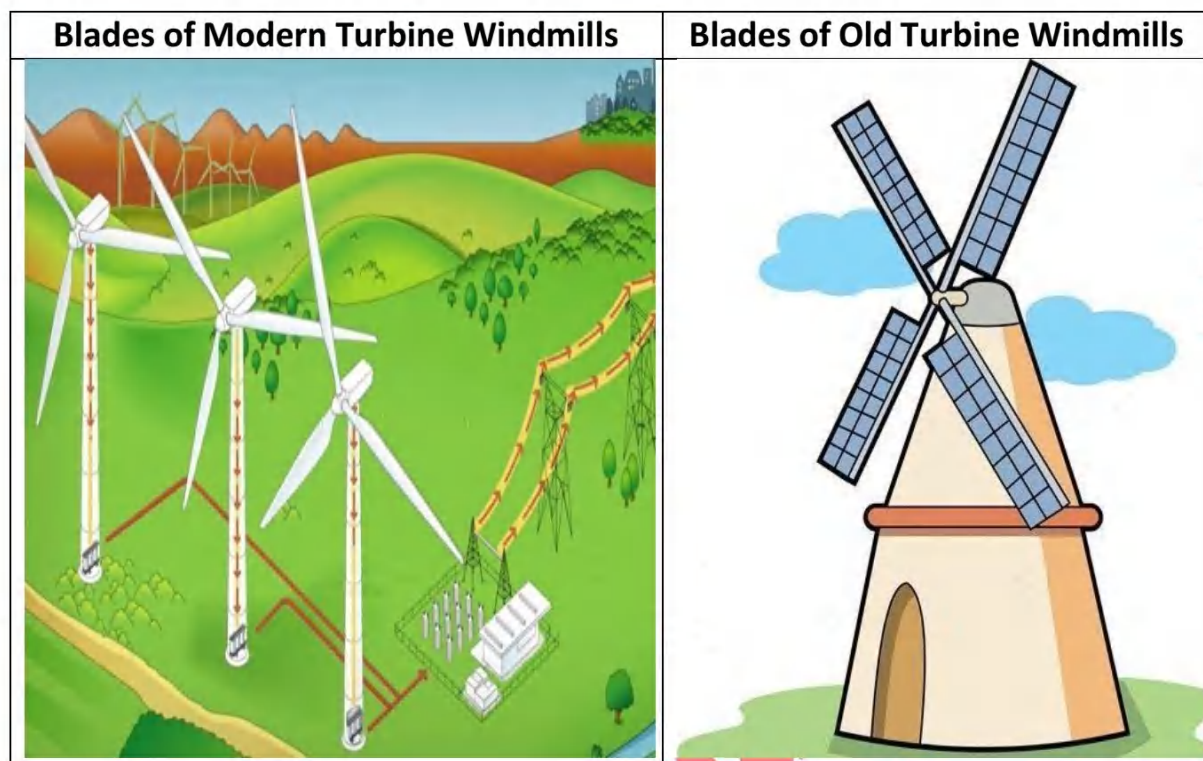
Radiant Energy
Sunlight
(Mechanical)

Thermal Energy
Warm and cool Air
(Mechanical)

Kinetic Energy
(Wind blow to turns
Wind Turbine)

Electrical Energy

Activity 8: Work as engineers to design blades for a wind turbine.



- ☐ What are some of the differences you see between the two images? *size, shape, number of blades, and angle.*
- ☐ How might the difference in the blades affect the generation of power? *All the differences may affect the speed of movement of the blades.*
- ☐ How did the shape of the blades affect the turbine? *Some shapes were able to pick up the wind easier than others. Some shapes worked better with fewer blades*
- ☐ What are the factors that affect the efficiency of energy transfer and transformation? *Size, shape, tilt toward or away from the wind, curvature of the blade.*

Lesson 4 :

Activity 9: **Falling Water:** Did you know water can also be used to generate electricity?



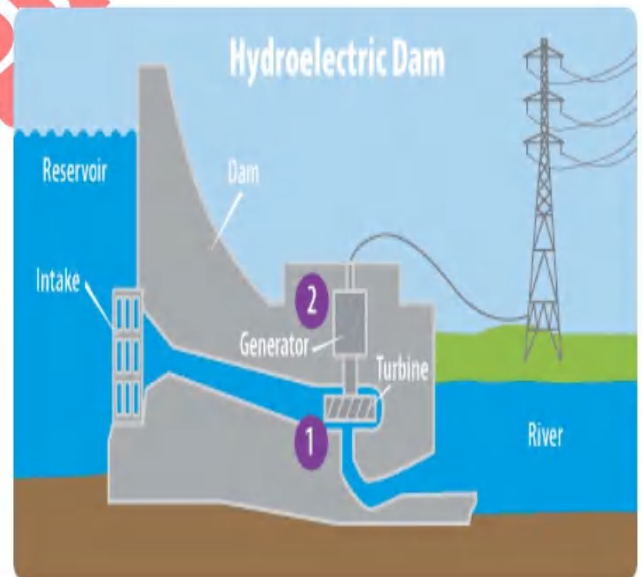
River runs downhill. As river runs, change gravitational potential energy to kinetic energy

that help water turbines rotate to generate electricity

Dams are built on rivers to control the water flow and increase the potential energy of water.

The turbines and generators in the dam generate electricity. The electricity can be sent along wires to cities where it is needed. This type of electricity is called **Hydroelectricity**

Hydroelectricity station



Water stored behind dam has **Gravitational potential energy**

When water runs downhill through dam **gravitational Potential energy** changes into **Kinetic energy**

Flowing water turns a water turbine. A generator attached to the turbine changes **kinetic energy** to **Electrical Energy**

Lesson (5)

Activity (8):

Modeling a turbine Generator (wind and water turbines) **(activity in the class)**

Note :

In water cycle , water evaporates by the heat of the sun, then it condenses in a form of clouds and returns back in a form of rain falling .



Concept 4.1

Breaking Down and Moving Rocks

- The factors change the earth's surface :

- Water

- Wind

- Weather changes

- **Natural Erosion:**

- Water and wind are some of the factors that can transport small rocks from one place to another forming a **"erosion"**.

Ex:

The disappearance of a part of sandcastle or all of it after few hours (erosion of the sandcastle), due to the transportation of the sand particles from its place to another by the effect of water (sea waves) or wind forces.



Notes:

- Water and wind are natural forces that are responsible for the erosion of sea coasts.
- Sand is formed by breaking down of rocks into smaller particles.
- The Earth's surface changes from time to time.



➤ Types of Earth's surface changes:

Fast changes	Slow changes
It may completely disappear in few minutes by the hitting of the sea waves. Such as : sand castle	There may be some little difference in its shape after many years if some parts break off. Such as: Coastal rocks
	

The similarities between the sandcastle and coastal rocks :

1. Both have steep needle-like parts.
2. Both have sloping sides at the bottom.
3. Water and wind create their shapes.

● Canyons:

They are deep valleys carved by flowing water.

Canyons are formed due to the slow changes that happened to its rocks.

The formation of canyons takes many years.

A Canyon has needle-like parts and slopes at the sides because of the action of water.

Lesson (2)



- **Sediments** could be sand, rocks or soil, and this depends on the environment which the process takes place.
- The difference between Weather and weathering :

Weather	Weathering
✓ it's the condition of atmosphere at a specific time and place. ✓ There are many factors affecting weather such as temperature , wind, rains,....ect ✓ The conditions of weather can help us to decide what to wear when we go outside.	✓ It is the breaking down of rocks on Erath's surface into smaller (tiny) pieces. ✓ There are many factors that cause weathering such as wind and water. ✓ Weathering can change the shape of Earth's surface over time.

- You can see the effect of weathering in many observations around you such as:

-**Breaking of statues.**

-**Removing of paints of buildings.**

-**Pulling a wave to the sand of seashores.**

- **Note:** Colder climate and ice are another factors that can change the landscape.
- There are two types of weathering which are Chemical weathering and Mechanical weathering
- **A Mechanical weathering:** It is the breaking down of rocks due to the effect of wind, water, plant roots and temperature.
 - The role of **wind** in mechanical weathering:
 1. Wind pushes the sand from a place to Another
 2. Friction occurs between sand and rocks so Rocks are broken down.
 - The role of **water** in mechanical weathering :
 1. Water runs over rocks.
 2. Water dissolves some substances in rocks so Rocks are broken down.
 - The role of **plant roots** in mechanical weathering:
 1. Plant roots grow inside the cracks of rocks.
 2. Crackse wider so rocks are broken down.
 - The role of **temperature** in mechanical weathering :
 1. Water flows into the tiny cracks of rocks When the temperature gets very cold, water Freezes forming ice that expands and makes The cracks of rocks become wider.
 2. When the temperature increases, the ice melts, so Water fills newly formed wide cracks again .
 3. This cycle make rocks are broken down.
- **Chemical weathering :** Is the change of the structure of rocks due to chemical reactions.
 - The role of **oxygen** in chemical weathering :

Oxygen of air reacts with iron of some rocks Forming **red-colored rust**, this reaction can Weaken rocks and break them down easily.



➤ The role of **water** in chemical weathering :

When water dissolves minerals in a Rock, the dissolved minerals combine again forming new shapes as in **Limestone caves**.

➤ The role of **acid rain** in chemical weathering:

When the acid rain fall on rocks, it can dissolve minerals found in these rocks, causing the breakdown of rocks.

➤ The role of **living organisms** in chemical Weathering

Some tiny organism called "**Lichens**" produce acids on rocks that dissolve minerals found in these rocks and break them down.

Note :

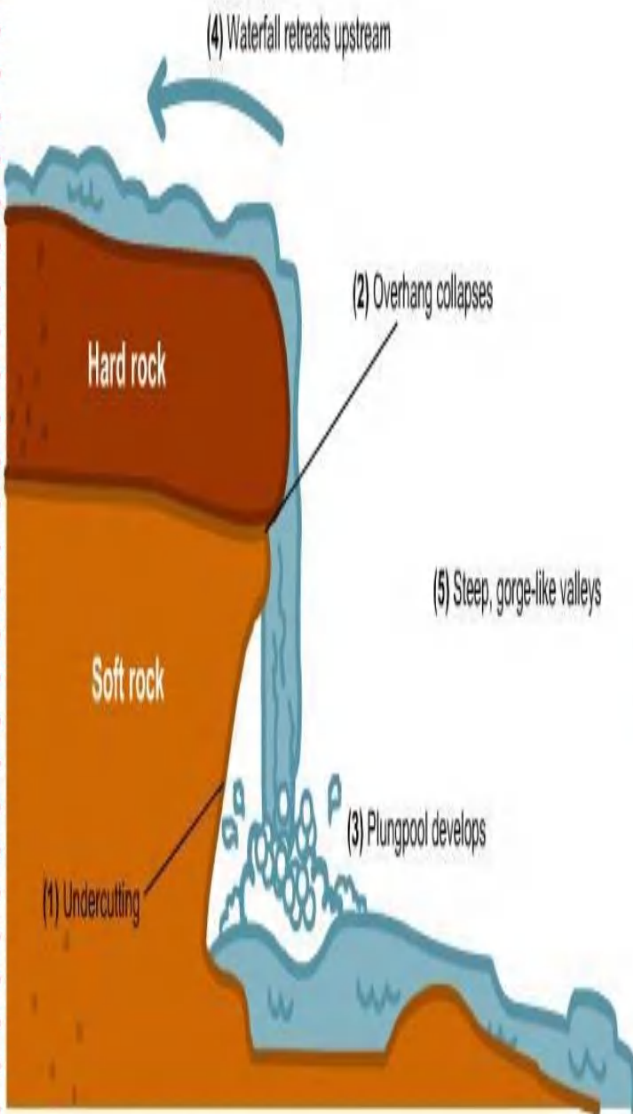
lichens are tiny plants grow on the surface of rocks and produce acid





Lesson (3) :

Landform : is formed by breaking rocks into smaller pieces with different shapes of the same material. This process is similar to that happened to biscuits broken by hands (mechanical weathering) .



- landform is formed mechanically weathered over time.



Lesson (4)

Erosion : It is the process in which the small particles of sand, soil and rocks are moved to other places by wind, water and gravity.

The small particles of sand, soil and rocks are called **Sediments**

❖ Action of wind erosion :

A gentle wind	A stronger wind
It may carry sand grains for a short distance (about 1 meter)	Like hurricanes carry them for a longer distance.

❖ Action of water erosion:

-Rivers and floods carry sand, soil and rocks downstream.

-Sea waves pull sand away from beaches.

-Rain washes away the soil of farms that locate beside downhill.

❖ Action of gravity erosion:

The broken weathered rocks in a mountain can be pulled down at mountainsides by the effect of gravity.

- **Formation of sedimentary rocks:** Sediments are mixed with mud and remain of plants and animals at the bottom of oceans, lakes and in deserts forming layers.
- **After erosion,** the deposition process is the next stage that shows where pieces of rocks might end up.

When the wind blows, it picks up sand into the air

As the wind moves, the sand may travel with it to a new place.

When the wind stops blowing, the sand falls onto the ground and deposits .

- **Deposition:** It is the process of laying down of sediments after its erosion.
- **Action of water in deposition:**

Running water in rivers play an important role in deposition process such as

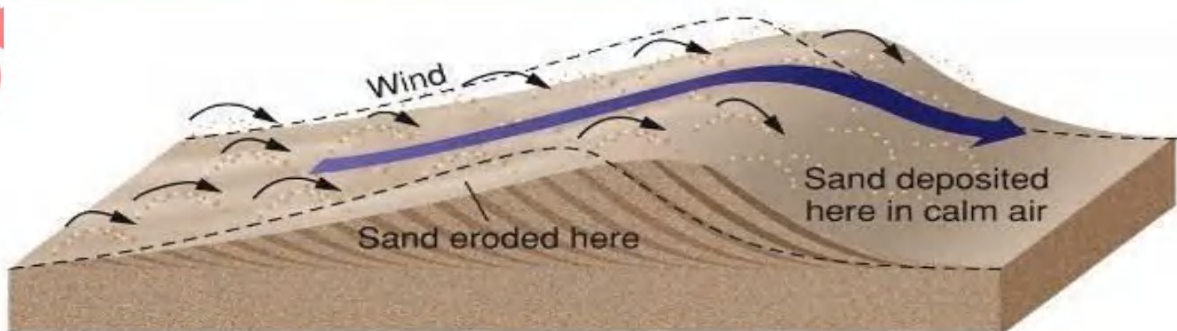
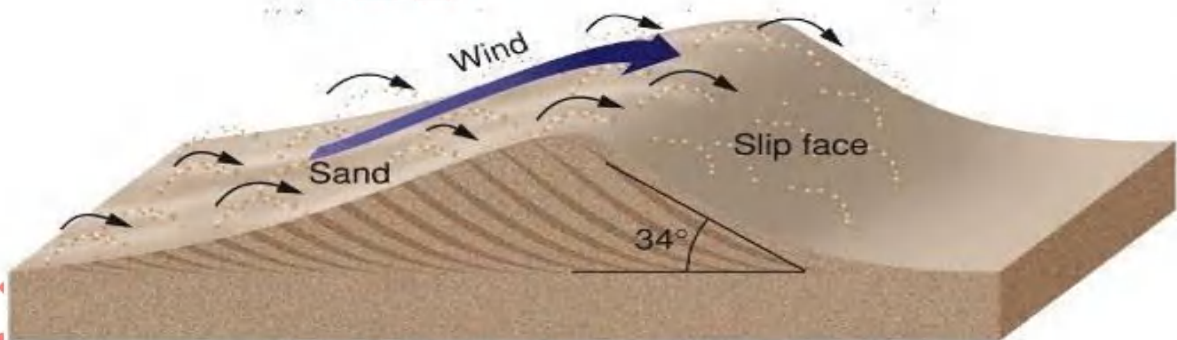
- A river can deposit a sandbar along its banks (sides) .
- When a river carries sediments meet a sea, these sediments are deposited there forming a delta such as the Nile Delta.

● **Delta :**

it is a fan shaped (triangle-shaped) mass of mud and other sediments that forms where a river enters a large body of water.

➤ **Action of wind deposition :**

Weak winds	Strong winds
They can form small sand dunes like Sand dunes on a beach.	-They can form large sand dunes like Sand dunes In Western Desert in Egypt. Rub' Al Khali in the Arabian Peninsula



Lesson (5)

➤ By the action of these processes (**weathering , erosion , deposition**) in order, we can observe changes in the Earth's surface such as:

- Sand dunes: which are small hills of sand found in a desert or on top of a beach.
- Delta: which is a piece of land shaped like a triangle that is formed when a river enters a large body of water such as a sea or an ocean.
- Deposition: it is the process of laying down of sediment after its erosion.



Concept 4.2

Lesson (1)

How are canyons formed?

A Canyon can be formed in many ways, such as weathering and erosion due to wind, water and other



Canyons differ in their colors, texture and shape of rocks, where:

- Wadi Nakhr canyon in Oman its color is brown and black but the Small Canyon in: Thailand has a reddish color.

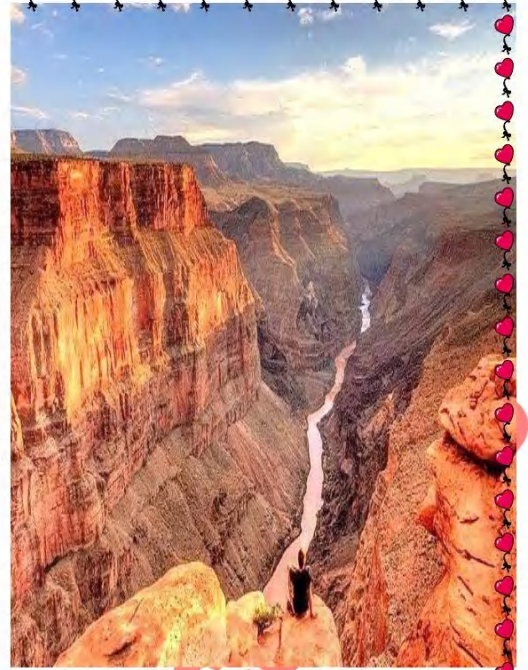
Canyons can have V-shape as in colored canyons in Sinai and Wadi Rum canyon in Jordan.

Canyon formation:

At the beginning of its formation by the effect of a stream of water, which can be observed from

The following evidence:

- Trees and other plants that are growing on both sides of canyon, need water to grow.
- The sides are gently sloped due to the help of water in wearing (eroding) the sides down.



Notes

Water streams that flow over flat land will probably form small canyons. The small canyon shown above could get deeper if it rained a lot, and water ran through it again.

Other forms of landforms such as:

Mountain -Dunes-Valley

Give reason for:

It might be useful to recognize signs of weathering , erosion and deposition.

Because it may help in building houses in safe places.

Lesson (2)

Example of fast changes



In the picture mudslide that represents a very quickly change in their landscape due to flooding rain

Examples of slow changes:

The picture shows a change in the landscape that contain a river and mountains.



How was this landform created?

When the river has worn away the Rock between mountains then wind and weather erosion could be breaking down the sides of the mountains.

They are two changes me happened to this landform which are

- 1-The river may get wider and the curves get bigger
- 2- The river may dry up leaving a small canyon between mountains.

Canyon are special types of valleys that have steep sides

1. Gravity pull rainwater downhill forming small streams
2. These small stream join together forming a bigger stream (river)
3. The water of the river flows fast across the land and erodes a pathway through the landscape that makes the river carve out a valley.



Grand Canyon:

It is located in United States of America

It is very large and steep canyon, and it contains many layers of rock.



Formation of the Grand Canyon:

1. Over long period of time (millions of years) the water of the river there
2. flowed so quickly due to travelling of river down a steep slope
3. The water of the river eroded the rock and cut them deeply
4. The fast flow of water eroded a lot of sediment and carry them away that leads to the formation of the Grand Canyon

Lesson (3)

Canyons and Valleys

Canyons:



Valleys:



They are wet eroded areas in the mountains
-their walls are very high (with great depth), steep, narrow, and consist of many layers of rocks

They are lowland areas in between mountains, with gently sloped sides that surround a wide flat plain.

Similarities: both of them can be formed by rivers or streams , have rivers or streams flow through the lowest points.

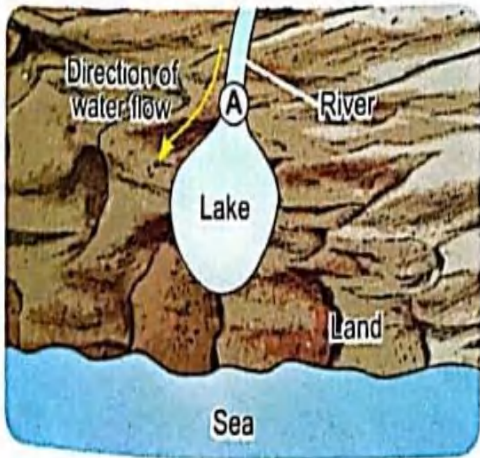
Delta formation



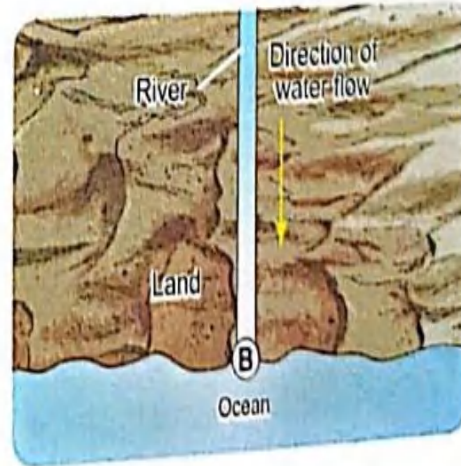
1. Streams or rivers which flow fast carry sediments which called silt
2. The river water flows and carries more sediments until the river water becomes full of sediments
3. When the speed of the river water decreases, it drops the sediments (silt) which carrying forming deltas

Note: Silt is made of very fine bits of sand, clay or rock materials

A delta can be formed at area (A) as the river (fast flowing water) enters the lake (still water).



A delta can be formed at area (B) as the river (fast flowing water) enters the ocean (slower flowing water).



Note:

1. Large wetlands are formed in deltas.
2. Plants that grow in the wetland found in deltas increase deposition process because:
 - Plants are partly responsible for slowing down the river water
 - Roots of plants help in trapping sediments

The Nile river delta:

It is the most famous deltas in the world.

The Nile River Delta has a triangular shape and it lies between Cairo and the northern coast of Egypt.

It was formed in Egypt as a result of the rapid flow of the Nile River, which travels a distance of about 6,600 kilometers to pour into the Mediterranean Sea.

It covers over 20,000 square km in Egypt, and it is characterized by the presence of fertile soil that allows the cultivation (planting) of different types of crops.

Lesson (4)

Wind erosion

It is the process of carving the rock into different shapes by wind blowing.



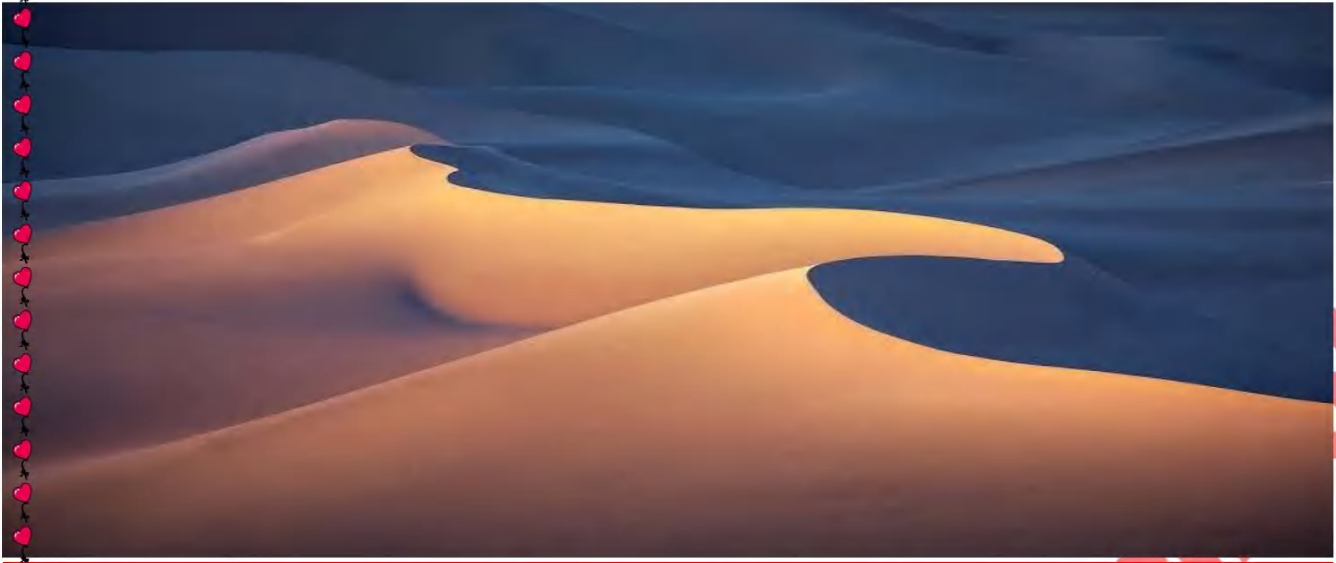
Steps of wind erosion:

- 1- When wind blows, it picks up sand and rock particles and carries them along.
- 2--When this flying sediment hits a rock , it wears down that rock-
- 3- Wind erosion carves the rocks into different shapes -

Erosion and deposition processes at the same time create sand dunes

Sand dunes:

It is the landform that is formed by erosion and deposition of sand in sandy desert environment



* Sand dunes are common landforms between beach and sandy desert

* Sand dunes depends on both force and direction

Sand dunes movement:

- When wind blow across a dune erode away from the side that wind is coming from.
- The sand grains carried by wind are collected along the slope of dune.
- When the sand reach to the top, the dune forms a barrier to the wind and sand grains roll down the other side

Generally, water and wind can change landscape over time

Such as (canyons, mountains, dunesetc.)

Sand shifters:

1-The wind moves the sand, where:

a-The distance traveled depends on the force of the wind.

b-The way that sand moves depends on the direction of the wind

2-The dunes are formed when the sand path is blocked like rocks blocking its path.

Lesson (5)

The landscapes change over time, where:

Sediments:

When rocks are weathered, tiny pieces that break down and float away.

-The layers of sediments may hold fossils that existed there in the past.

Geologists: are scientists who study rocks.

-Geologists call each separated rock layer a formation.

Gr: Geologists study the layers of sediments in rock formations?

-To know how the landscapes looked like in the past

Formation of rock layers of Wadi Al-Hitan:

Found in: Fayoum in the western desert of Egypt.

-It changes over time as follows:

1- When rocks were weathered, sediments are floated away.

2- Sediments build up in layers at the bottom of a sea

Note: all of northern Egypt was a sea from 40 million year ago

3-As the sea moved out, the layers of sediments formed sedimentary rocks

Such as limestone and sandstone

Arrangement of rock layers in wadi al-hitan:

-The top layers contain newest rocks

-The bottom layers contain oldest rocks that contain sedimentary rocks contain fossils tell us the deep of the sea



Some fossils of Wadi Al - Hitan :

-Skeleton of crocodile, whales, sea cows and turtle

-Shark teeth

Describing landforms:

Canyons and valleys are formed due to erosion by water and wind -

Deltas:

Are fan-shaped (triangular shape) landforms.

They are formed due to deposition process when river enter lakes, seas or oceans-

Sand dunes are formed due to erosion -

Deposition process caused by wind-

Note: in general erosion happens slowly, but can happen quickly during storm or rockslide

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امسح الباركود بالمويل لتثبيت
التطبيق وتحميل كل الملازم مجاناً وبسرعه



حمل التطبيق الآن



كورسات ونتائج امتحانات



ملازم ثانوي



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